

PATENT
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**IN THE UNITED STATES PATENT
AND TRADEMARK OFFICE**

substances may adhere to the surface of the photosensitive drum from the sheet. Japanese Laid-Open Patent Publication No. 61-121076 discloses a device provided with a cleaning blade which is in contact with a surface of a photosensitive body at all times in order to physically remove contaminants adhering the photosensitive body.

[0005] Because the cleaning blade is in contact with the surface of the photosensitive body at all times, the surface of the photosensitive body may be damaged or scratched if the contacting force of the cleaning blade against the surface of the photosensitive body is too strong. However, if the contacting force is too weak, the contaminants cannot be adequately removed from the surface of the photosensitive body, resulting in degradation of an image quality.

SUMMARY OF THE INVENTION

[0006] The invention addresses the above problems, and provides a more efficient cleaning system, by providing a contamination removing member that is capable for being placed into contact with a photosensitive element and withdrawn from that contact. When in contact with the photosensitive element, the contamination main moving member removes

contaminants such as paper dust or residual toner from the photosensitive element. When withdrawn from the photosensitive element, there being no contact with that element, damage caused by the removing member can be minimized or damage to the photosensitive element by the contaminant removing member is minimized. Thus, the life of the photosensitive element is increased.

[0007] The removal operation is conducted at specified events. Among the events that may be used, either alone or in combination, are at the time a toner cartridge is indicated as empty, a time when an empty toner cartridge is replaced, after a predetermined number of sheets have been printed, during a warm-up session of the printer, or after the printing apparatus has been warmed up but prior to commencing printing.

[0008] In most embodiments, the contaminant removing member is an integral part of the printing apparatus. In those embodiments, it also includes an engagement and disengagement moving mechanism that brings the contaminant removing member into contact with the photosensitive element and withdraws the contaminant removing member therefrom. In some embodiments, the contaminant removing member may be a removable element that is manually attached to one of a photosensitive element cartridge or a developer containing cartridge. In these latter type cartridges, the most common time for use of the contaminant removing member is when the developer containing cartridge is changed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Embodiments of the invention will be described in detail with reference to the following figures wherein:

[0010] FIG. 1 is a sectional side view showing essential parts of a laser-beam printer of a first embodiment of the invention;

[0011] FIG. 2 is a sectional side view showing essential parts of a processing unit used for the laser-beam printer of FIG. 1;

[0012] FIG. 3A is a side view showing a cleaning portion of the processing unit of FIG. 2 with the cleaning portion positioned at a distance from a photosensitive drum (disengaged state);

[0013] FIG. 3B is a plan view showing the cleaning portion of the processing unit of FIG. 2 with the cleaning portion positioned at a distance from a photosensitive drum (disengaged state);